A Study on MALARIA CONTROL PROGRAM in Lombok and Sumbawa, Indonesia :

Collecting Baseline Data and Epidemiological/ Sociological Survey, Part 2 (CBDESS II)

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〔抄　録〕

本稿は，インドネシア国立マタラム大学医学部ムリヤント教授チームと佛教大学社会学部満田教授グループとが協力し，2006 年から 3 カ年計画でスタートしたマラリア・アウトブレイクの制御管理を目指す MALARIA CONTROL PROGRAM（MCP）国際共同研究の中間報告である。MCP 研究では，マラリア感染拡大の原因究明を疫学的観点からのみならず，経済・社会・政治・文化要因といった社会学的諸要因の実証研究によって明らかにすることを主たる目的としている。

MCP 研究では，2006 年にマラリア・アウトブレイクが発生した東ロンボク島の 4 つの村を対象に，第 1 回マラリアアウトブレイク社会疫学的調査（CBDESS I）を実施した。その結果によると，アウトブレイクは，①地球気候変動による集中豪雨に伴うマラリア蚊の異常発生【気候変動要因】②乱開発による居住地周辺での蚊の飛散【自然破壊要因】③都市化・工業化によるマラリア患者の急速な拡散【経済社会的要因】など，従来のマラリア対策で看過されていた医学的要因以外，とくに社会変動に伴う社会学的要因が強く影響しており，社会的解決の重要性を認識する必要がある（本誌第 46 号参照）。そこで，2007 年 8 月に実施した第 2 回マラリアアウトブレイク社会疫学的調査（CBDESS II）では，地勢的特徴と社会文化的背景の比較を通して，マラリア感染拡大に関する要因相互関係を解明し，その社会的解決について政策議論する。具体的には，ラグーンの多い沿岸地域に位置する Bungin 村や Pemongkong 村と，山間高地地域に位置する Swela 村や Tanjung 村との地域間比較研究をおこなう。さらに CBDESS II では，当該地域での宗教的指導者・地方政府役人・医者・看護師・学校関係者・社会活動家・主婦などのインタビューと第 2 次的資料の収集と分析を行い，マラリア感染拡大の質的研究を深めている。

キーワード　malaria, Village Malaria Post, Malaria Village Worker, Lombok and Sumbawa, epidemiological survey

1. Introduction

1. 1. Background

The malaria control program in West Nusa Tenggara (WNT) faced different problems compared to other areas of Indonesia. West Nusa Tenggara is not as prosperous as some other areas in Indonesia. Many citizens of West Nusa Tenggara worked as migrant laborers in other areas of Indonesia or even other countries. The human development index is also the lowest in Indonesia.

The nature of the environment is ideal for vector breeding and there is a serious lack of community awareness related to malaria and malaria control. Due to the increasing malaria burden, the Malaria Control Program in West Nusa Tenggara needs to be revitalized. Revitalization of the program would need a strategy that can overcome the nature of malaria problem itself as a unique disease that roots deeply within communities.

Malaria parasites are circulating inside individuals in the community. They will be transmitted to other members of the community by mosquitoes that also live in the community. It is also the community members themselves who will first notice whenever one of them suffered from malaria. Any lack of function in any part of the community will hinder the control program as a whole. In turn malaria will impair community productivity by preventing community member from working both for the affected individuals and their family. Impaired productivity will bring domino effect that leads to be low level of economy and education resulting in a poor and under-educated community. Such kind of burden that malaria can bring for a community makes it important to create a sustainable community-based control program. An integrated approach comprising preventive measures and curative measures with emphasized community self-powered activities seems to be an ideal strategy for the sake of successful revitalization of the malaria control program. The malaria control program has to be selected by considering social, economic, cultural and religious aspects that the community is willing to adopt it in daily life.

The two major islands of West Nusa Tenggara province, i.e., Lombok and Sumbawa Islands, have a longstanding history of malaria, especially in the coastal areas. The malaria control program has been implemented with a considerable level of successes. But, malaria is still a serious problem enough by continuing its transmission in several areas of Lombok and Sumbawa. It calls great attention of the local government of West Nusa Tenggara who stated a goal that malaria should be eradicated by 2020. In order to achieve the goal, the local government will use Early Diagnosis and Prompt Treatment (EDPT) through health operational unit, Active Case Finding and field treatment through Village Malaria Post. This strategy has been conducted since 2003 in five prov-

inces in eastern Indonesia, namely Papua, West Papua, Maluku, North Maluku and East Nusa Tenggara supported by grant from Global Fund. In West Nusa Tenggara, there were also several joint malaria control programs between local and international institutions. One large scale control program was the cooperative malaria control project between Indonesian and Japanese universities and institutions from 2001 to 2004 at small malaria endemic villages on Lombok and Sumbawa Islands as a pilot project. This malaria control project was later evaluated by gathering opinions of the researched villagers. It was concluded that after the project was implemented, malaria incidence was significantly reduced in Lombok, but not in Sumbawa.

In 2006 to 2007 there were two epidemiological researches aimed at establishing starting the point to revitalize the malaria control program in West Nusa Tenggara. The one was CBDESS I and the other was ACD (Active Case Detection) project. CBDESS I aimed to examine the relationship among social, economic, cultural, and religious aspects related to malaria transmission. The ACD project was an action research. Aside from collecting research data, the ACD project started to reinforce local health workers to act as malaria village workers. During the ACD study period, malaria cases were decreased.

In the year 2008 government plans to create 500 village malaria posts in West Nusa Tenggara. The Village Malaria Post (VMP) will provide a field treatment for the infectious community. The VMP will also play a role of the community malaria education center.

The researches on anti-malarial drug resistance in Indonesia showed evidence of growing numbers of chloroquine resistant malaria including in West Nusa Tenggara. This also adds to the problem that should be taken into account in revitalizing the malaria control program. It leads to the need to modify the treatment protocols for the medical and health providers and policy to provide the appropriate drug by the local government.

1. 2. Objectives

The major objective is to investigate the relationship among social, economic, cultural and religious aspects related with malaria transmission in hilly and coastal areas of East Lombok and Sumbawa.

The specific objectives are to :

1) Identify the social, economic, cultural and religious characteristics of the community

2) Investigate the difference in patterns of malaria transmission aspects between high and low density population

3) Investigate the difference in patterns of malaria transmission aspects in high and moderate endemicity areas

4) Investigate the difference in patterns of malaria transmission

5) Investigate knowledge and behavior aspects of the community

6) Identify knowledge and behavior aspect of the community

7) Identify influential persons as a potential agent of change toward a better malaria prevention behavior

8) Investigate knowledge, behavior, perception and participation in the past malaria control program among community leaders

1. 3. Methods

1. 3. 1. Study Area and Population

Nusa Tenggara Barat Province is composed of two main islands, i.e., Lombok and Sumbawa islands with total area 20,153.15 square kilometer inhabited by 4,257,306 people in the year of 2006. The archipelago stretches along the equator between longitude 115 o 46 'and 119 o 5' east and latitude 8 o 10 'and 9 o 5' south.

N. T. B. Province consists of 7 districts, 103 sub-districts, and 838 villages. Sumbawa Island is almost three times as big as Lombok Island, but inhabited by one third as many residents as Lombok Island. Sumbawa Island is approximately 14,386 square kilometers with 1,242,061 populations, while Lombok Island is approximately 5,435 square kilometers with population of 3,015,245.

Population at risk of acquiring malaria and targeted by this project are in the Sepit village in Keruak sub-district, Prigi village in Swela sub-district, Pemongkong village of Jerowaru sub-district of East Lombok, and Bungin Island village in Alas sub-district of Sumbawa.

East Lombok covers a total area of about 3,498.5 square kilometers, nearly 1,605.5 square kilometers land and 1,654.15 square kilometers sea with 220 kilometer coastline. East Lombok has a tropical climate with highest rainfall of 281 mm in December and lowest rainfall of 2 mm in August. Mean annual rainfall is 1,218.50 mm. East Lombok

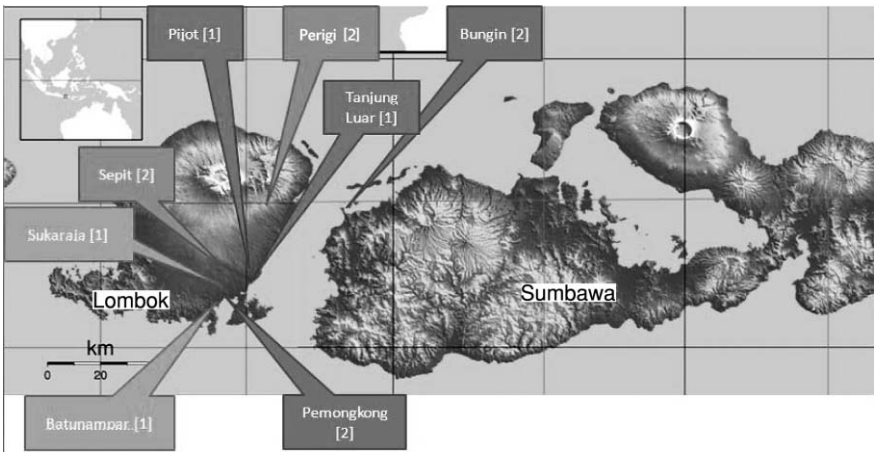

Figure 1　Map showing locations of CBDESS I and II in Lombok and Sumbawa Islands

population increased from 370.92/km^2 in 1995 to 598.16/km^2 in 2000. Annual income per capita is approximately USD 300 which mainly came from the agricultural sector in 2006.

Sepit village is one of four villages in Keruak sub-district of East Lombok. Sepit village is approximately 17.96 km^2 inhabited by 12,779 people, with covers no coastal region. Perigi village is one of six villages in Swela sub-district of East Lombok. Swela sub-district covers a total area of about 115.01 km^2 and about 90% of Swela sub-district is hilly land. Malaria outbreak occurred in Perigi village of Swela in the early March, 2007. There were 90 patients positive suffering from malaria, mostly came from Jeringo sub-village. Of the total patients, 85 patients were positive of Plasmodium falciparum and 5 patients positive of Plasmodium vivax.

Pemongkong village is approximately 83.95 km^2 inhabited by 14,119 people. Pemongkong village is the widest village in Jerowaru sub-district (58.79 % of total area of Jerowaru sub-district). Pemongkong village is the southern part of East Lombok with almost of all areas is a coastal region.

Sumbawa District is the eastern part of Sumbawa Island stretches along the equator between 116 o 42' 118 o 22' east longitude from and 8 o 8' 907' south latitude. Pulau Bungin village in Alas sub-district of Sumbawa District is approximately 2 km^2 inhabited by 2,941 people (BPS, 2006). Bungin is an artificial island made by local people. Bungin, in Bugis language means white sands island in the sea. Bungin villagers are of Bugis ethnicity that started moving from Selayar, South Sulawesi as early as 1815.

1. 3. 2. Study Design

A comparative study will be made using primary data obtained from a survey to explore all community aspect information such as its history, demographic data. This cross sectional study uses the geographic characteristics, i.e., coastal vs. hilly areas as dependent variable. The independent variables are social, economic, cultural, and religious aspects of the community.

The CBDESS II analysis will consist of malaria trends, socio-demographic, economic, cultural, and religious characteristics, community involvement in previous programs and community knowledge and behavior related to malaria transmission in the study area.

The socio-economic data will include population demographics : number, age, sex, level of education, occupation, health indexes, social activity, income, expenditure, ownership, and migrant laborers activity. Knowledge of malaria is determined based on three constructs, i.e. recognized malaria symptoms, prevention and treatment. Composite frequency of the three constructs is then used to divide the knowledge into three categories, including good (know malaria symptoms, prevention and treatment), moderate (know at least two constructs), or poor (know only one construct or none).

Malaria, in general, manifests as fever which is resulted from simultaneous rupturing

of red blood cells following large-scale parasite multiplication. Chills and sweating are often accompanied by a fever. Other symptoms may be headache and joint pains. Fever accompanied by periodic chills and sweating is the classic symptom of malaria. Respondents will be asked to mention any malaria symptoms they know. Knowing three of those symptoms is cutoff point for knowledge of malaria symptom.

Prevention, as the second construct, involves a wide range of prevention method, including human behavior modification, environmental management and vector control. Certain habits or behaviors make human become more vulnerable, i.e. travelling to endemic areas, outdoor activities during mosquito's biting time at night, wearing without any cloth to protect against mosquitoes and so forth. Modifying these behaviors has been effective in preventing malaria. Furthermore, managing the environment by creating an unfavorable milieu for anopheles mosquito is another important means of prevention. This may include environmental modification, environmental manipulation, and human habitual modification. To combine vector control method such as biological predator with chemical control, it is believed to provide a paramount malaria control. Knowing two of the three malaria prevention methods is used as the cutoff point.

Knowing the treatment of malaria is the last construct of malaria knowledge. Whenever respondent can mention at least one malaria medication, then he or she is considered to have a good knowledge of malaria treatment.

Local custom, culture and religion of the community will be observed to reveal the possibility of developing new approach to implement the preventive measures in the community. Key persons who have potential ability to influence community toward better malaria behavior will be identified. Community events will also be identified as a baseline to develop community malaria events.

This study will use two stage stratified random sampling with endemicity as cluster. In precision rate 1%, confidence level 99% and proportion 0.0172, the minimal samples is 936.

2. Results of collecting baseline data and epidemiological/sociological survey, part 2 (CBDESS II)

2. 1. Respondent's characteristics

2. 1. 1. Demographic characteristics

A total of 1019 respondents from 4 malaria endemic villages, i.e. Pulau Bungin (325 respondents), Perigi in Swela (298 respondents), Sepit (198 respondents) and Pemongkong (198 respondents) participated in the study. In general, the ratio of respondents in this study is that 60.2% (613) are men and 39.8% (406) are women. The median of respondent's age is 40 years old and most of them (86.9%) are in their most productive middle

Table 1　Respondent's socio-demographic characteristics

CHARACTERISTICS	VILLAGE NAME			
	COASTAL		HILL	
	PEMONGKONG(%)	BUNGIN(%)	PERIGI(%)	SEPIT(%)
Age				
–< 20 year old	6 (3.0)	4 (1.2)	5 (1.7)	3 (1.5)
–20 –30 year old	34 (17.2)	57 (17.5)	64 (21.5)	34 (17.2)
–30 –40 year old	59 (29.8)	94 (28.9)	87 (29.2)	59 (29.8)
–40 –50 year old	50 (25.3)	78 (24.0)	63 (21.1)	50 (25.3)
–50 –60 year old	33 (16.7)	54 (16.6)	35 (11.7)	33 (16.7)
–> 60 year old	16 (8.1)	38 (11.7)	44 (14.8)	16 (8.1)
Sex				
–Male	119 (60.1)	210 (64.6)	139 (46.6)	210 (64.6)
–Female	79 (39.9)	115 (35.4)	159 (53.4)	115 (35.4)
Ethnicity				
–Bajo	0 (0.0)	287 (88.3)	0 (0.0)	0 (0.0)
–Bima	0 (0.0)	2 (0.6)	0 (0.0)	0 (0.0)
–Bugis	0 (0.0)	15 (4.6)	0 (0.0)	0 (0.0)
–Bungin	0 (0.0)	6 (1.8)	0 (0.0)	0 (0.0)
–Java	0 (0.0)	1 (0.3)	0 (0.0)	0 (0.0)
–Mandar	0 (0.0)	3 (0.9)	0 (0.0)	0 (0.0)
–Mandarin	0 (0.0)	1 (0.3)	0 (0.0)	0 (0.0)
–Sasak	198(100.0)	6 (1.8)	298(100.0)	198(100.0)
–Sulawesi	0 (0.0)	2 (0.6)	0 (0.0)	0 (0.0)
–Sumbawa	0 (0.0)	1 (0.3)	0 (0.0)	0 (0.0)

ages. More than 90 percent of respondents in West Nusa Tenggara (WNT) are Muslim and the major ethnic group is Sasak in Lombok and Sumbawa except Bungin island which is dominated by migrants from Sulawesi such as Bajo, Bugis and Mandar. Table 1 is summarized the socio- demographic characteristics of respondents in the four villages.

The majority of respondent's education level (54.7%) is elementary school. However, there are a considerable number of respondents (22.5%) that never attained at any formal education. There are very fewer respondents that continued studying at a higher level of education, i.e. junior high school, senior high school and so forth. Moreover, there is a gender bias on educational experiences and achievements. The number of men that attended schools is higher than women in all four villages (Figure 2).

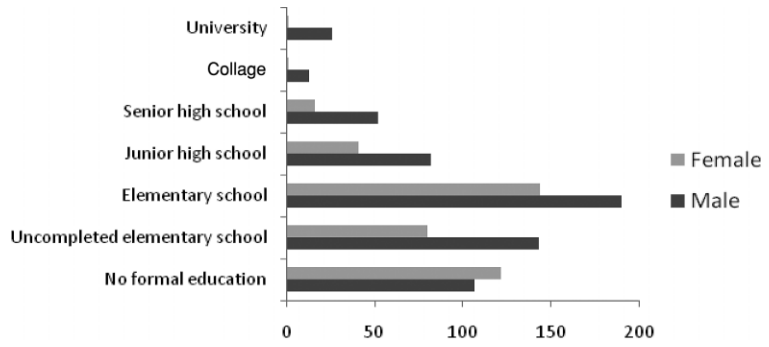

Figure 2　Respondents' formal education level

The occupation is varied within different area characteristics. Most respondents living in coastal area work as fishermen while those in hilly lands work as farmers or farm laborers. Pemongkong village has a unique characteristic in which part of the area is coastal while the rest of the land is flatland. Therefore, fisherman and farmer are the most common occupation in the community. Furthermore, in coastal are, women aren't go fishing or sailing but tend to work in the farm land, commonly for self-consuming and opening a kiosk.

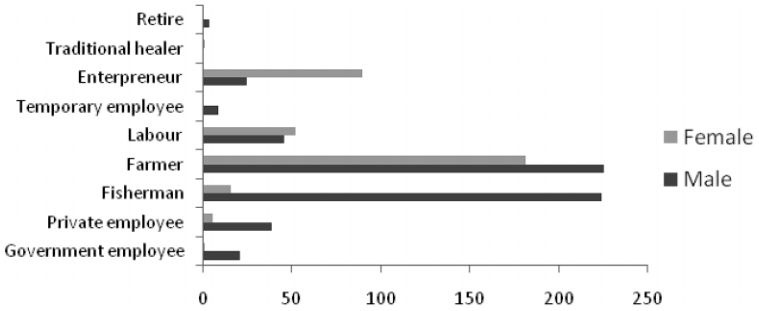

Figure 3　Respondents' occupation

2. 1. 2. Economic status

Most respondents in the four villages have monthly wages of less than 500,000 Indonesian Rupiahs (IDR), excluding Sepit village in which most of them have wages between 500,000 to 1,000,000 IDR. Among respondents with wages less than 1,000,000 IDR, it is obvious that providing daily meal is put as the first priority. The distribution of respondent's wages and expenditures is summarized in table 2.

Table 2　Respondent's economic status

CHARACTERISTICS	VILLAGE NAME			
	COASTAL		HILL	
	PEMONGKONG(%)	BUNGIN(%)	PERIGI(%)	SEPIT(%)
Average family wages per month (1,000 IDR)				
• ＜500	137(72.1)	139(43.6)	270(91.2)	68(34.7)
• 500 to 1,000	48(25.3)	135(42.3)	22 (7.4)	98(50.0)
• 1,000 to 2,000	4 (2.1)	33(10.3)	4 (1.4)	26(13.3)
• ＞2,000	1 (0.5)	12 (3.8)	0 (0.0)	4 (2.0)
Average family expenditure per month (1,000 IDR)				
1. Daily needs				
• ＜100	37(18.8)	46(14.5)	47(15.8)	15 (7.7)
• 100 to 500	156(79.2)	134(42.3)	246(82.6)	152(77.9)
• 500 to 1,000	2 (1.0)	113(35.6)	5 (1.7)	22(11.3)
• ＞1,000	2 (1.0)	24 (7.6)	0 (0.0)	6 (3.1)
2. Health care				
• ＜100	118(95.9)	209(68.8)	243(98.4)	157(80.1)
• 100 to 500	5 (4.1)	89(29.3)	4 (1.6)	38(19.4)
• 500 to 1,000	0 (0.0)	6 (2.0)	0 (0.0)	1 (0.5)
• ＞1,000	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)

3. Education				
• ＜100	96(61.9)	163(67.9)	250(91.2)	108(55.1)
• 100 to 500	57(36.8)	60(25.0)	24 (8.8)	75(38.3)
• 500 to 1,000	2 (1.3)	15 (6.3)	0 (0.0)	11 (5.6)
• ＞1,000	0 (0.0)	2 (0.8)	0 (0.0)	2 (1.0)
4. Transportation				
• ＜100	123(80.4)	163(56.4)	231 (94.7)	95(48.5)
• 100 to 500	30(19.6)	106(36.7)	13 (5.3)	97(49.5)
• 500 to 1,000	0 (0.0)	16 (5.5)	0 (0.0)	3 (1.5)
• ＞1,000	0 (0.0)	4 (1.4)	0 (0.0)	1 (0.5)
5. Leisure				
• ＜100	9(90.0)	102(85.7)	233(100.0)	164(88.2)
• 100 to 500	1(10.0)	16(13.4)	0 (0.0)	21(11.3)
• 500 to 1,000	0 (0.0)	1 (0.8)	0 (0.0)	1 (0.5)
• ＞1,000	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)
Ownership status of the house				
• Personal house	184(92.9)	265(82.3)	250(84.5)	176(89.3)
• Parent's house	11 (5.6)	46(14.3)	35(11.8)	20(10.2)
• Child's house	0 (0.0)	6 (1.9)	0 (0.0)	0 (0.0)
• Family's house	0 (0.0)	0 (0.0)	5 (1.7)	0 (0.0)
• Lodging house	0 (0.0)	0 (0.0)	0 (0.0)	1 (0.5)
• Government's house	0 (0.0)	2 (0.6)	3 (1.0)	0 (0.0)
• Joint with others	1 (0.5)	3 (0.9)	3 (1.0)	0 (0.0)
Livestock(s) (cow, buffalo, goat, horse, chicken, quail, etc)	127(64.1)	108(33.2)	194(65.1)	138(69.7)
Electrical equipment's ownership				
• Television	35(17.7)	215(66.2)	16 (5.4)	111(56.1)
• Radio	62(31.3)	41(12.6)	52 (17.4)	124(62.6)
• Computer	1 (0.5)	1 (0.3)	0 (0.0)	9 (4.5)
• Refrigerator	2 (1.0)	35(10.8)	0 (0.0)	17 (8.6)
• Phone	28(14.1)	55(16.9)	2 (0.7)	61(30.8)
Transportation vehicle's ownership				
• Cidomo (traditional cart)	7 (3.5)	6 (1.8)	2 (0.7)	1 (0.5)
• Bicycle	16 (8.1)	12 (3.7)	8 (2.7)	10 (5.1)
• Motorcycle	37(18.7)	37(11.4)	19 (6.4)	82(41.9)
• Car/truck	3 (1.5)	0 (0.0)	1 (0.3)	7 (3.5)
• Boat	48(24.2)	163(50.2)	2 (0.7)	3 (1.5)

2. 2. Malaria experiences

In general, most respondents (59.8%) mentioned that they had suffered from malaria (See Table 3). However, it was not the case in Bungin and Perigi villages, in which fewer respondents experienced suffering from malaria (35.2% and 38.6%, respectively). Moreover, there are fewer respondents (12.0%) who were suffering from malaria during pregnancy. During their period of illness, most respondents visited medical doctor and community health center (PUSKESUMAS). Specifically in Bungin, medical doctors are the main provider for home-visit nursing care. Despite experiencing malaria, there are fewer respondents that can properly mention the proper medication for malaria. Table 3 summarized respondent's experience of malaria.

2. 3. Knowledge, attitude and practice of malaria

The majority of respondents recognized malaria (48.9%) as the most dangerous disease,

Table 3　Malaria experiences

CHARACTERISTICS	VILLAGE NAME			
	COASTAL		HILL	
	PEMONGKONG(%)	BUNGIN(%)	PERIGI(%)	SEPIT(%)
Experience of suffering from malaria	264(81.5)	105(35.2)	76(38.6)	165(83.3)
Provider visited when suffered from malaria				
• Medical doctor	2 (1.2)	164(62.4)	1 (1.0)	11(14.7)
• Community health centre (Puskesmas)	107(65.6)	79(30.0)	79(76.7)	59(78.7)
• Health cadre	5 (3.1)	2 (0.8)	4 (3.9)	0 (0.0)
• Hospital	6(17.2)	5 (1.9)	0 (0.0)	2 (2.7)
• Traditional healer	28 (3.7)	3 (1.1)	18(17.5)	0 (0.0)
• No provider visited	15 (9.2)	10 (3.8)	1 (1.0)	3 (4.0)
Have had malaria during pregnancy	25(12.6)	86(26.5)	11 (3.7)	0 (0.0)
Medication taken for malaria				
• Amoxicillin	0 (0.0)	0 (0.0)	0 (0.0)	2 (1.0)
• Chloroquine	0 (0.0)	0 (0.0)	0 (0.0)	4 (2.0)
• Fansidar	0 (0.0)	1 (0.3)	1 (0.3)	1 (0.5)
• Primaquine	1 (0.5)	2 (0.6)	1 (0.3)	0 (0.0)
• Quinine	0 (0.0)	4 (1.2)	0 (0.0)	0 (0.0)
• Resochine	7 (3.5)	7 (2.2)	1 (0.3)	5 (2.5)
• Pill(s), capsule(s), or injection(s)	102(51.5)	197(60.6)	77(25.8)	41(20.7)
• Traditional medicine	4 (0.0)	3 (0.9)	0 (0.0)	0 (0.0)
• Magical formula	21(10.6)	3 (0.9)	3 (1.0)	0 (0.0)
• Massage	2 (1.0)	0 (0.0)	0 (0.0)	0 (0.0)
• No medication	1 (0.5)	0 (0.0)	0 (0.0)	0 (0.0)

followed by diarrhoea (13.7%), fever (4.4%), tuberculosis (4.0%) and skin disease (3.2%) (see Figure 4). Within the four villages, only respondents in Sepit village consider diarrhoea as the most dangerous disease (23.4%).

Although most respondents considered malaria as the most dangerous disease and many of them experienced malaria, it is not consequently followed with better understanding of malaria. With regard to malaria symptoms, fifty one percent of respondents in this study know three or more symptoms of malaria, including fever, shivering, sweating, headache, abdominal symptoms, fatigue, respiratory symptoms and seizures. Fever and shivering are the most common known symptoms of malaria (Figure 4). Furthermore, the knowledge of malaria symptoms between coastal and hilly areas is different significantly ($p < 0.001$). Nevertheless, the correlation between the area characteristics and the knowledge of malaria symptoms is weak (Spearman correlation $= -1.36$). The Spearman rank analysis result suggests that respondents in the coastal area know less about malaria symptoms compared to those at the hilly area.

Concerning malaria transmission, most respondents (76.1%) perceive that malaria is a communicable disease ; however, few know that malaria is transmitted through mosquito bite (29.7%). As a result, there were fewer respondents (0.9%) that familiar with malaria prevention methods.

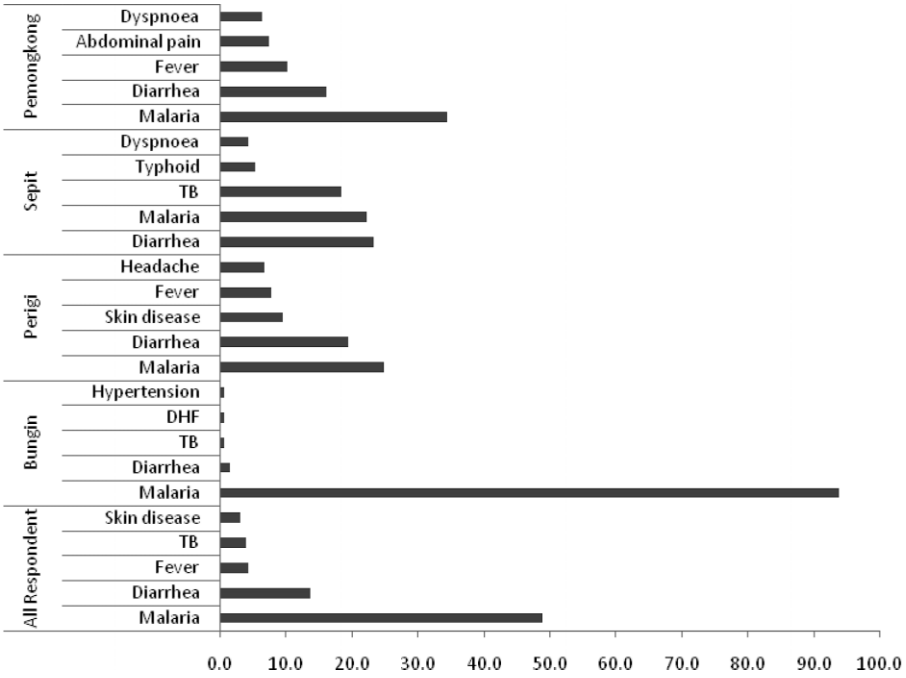

Figure 4　Community perception regarding the most dangerous disease

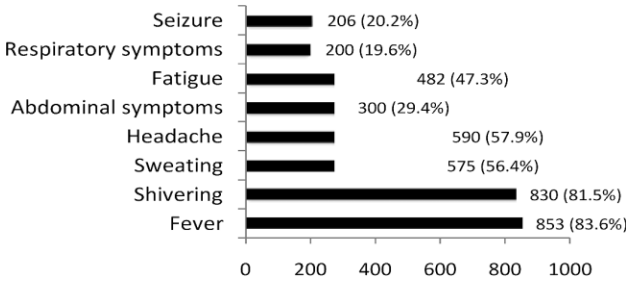

Figure 5　Knowledge of malaria symptoms

The prevention for malaria in most cases is targeted toward modifying human behavior, managing the environment and controlling the vector (Anopheles mosquito). The only well recognized malaria prevention was the application of anti-mosquito, use of mosquito's chemical control, and sleeping under a bed net (figure 6). By comparison with the area characteristics, the knowledge of malaria prevention is not different significantly ($p = 0.799$).

The knowledge of malaria treatment is relatively poor. It is that only 4.7% respondents can identify the proper treatments for malaria. Among any available treatment, "resochine" medicine is widely recognized as the cure of malaria (72.9%). Figure 7. summarized the commonly known medicines for malaria. There is a significant different statisti-

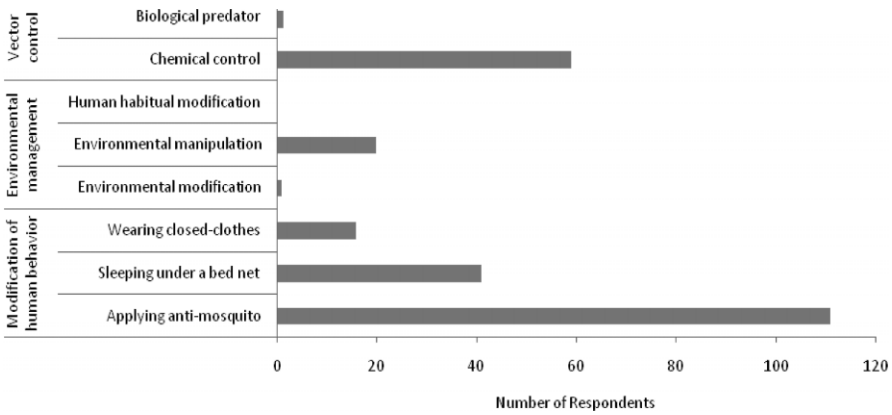

Figure 6　Recognition of malaria prevention method

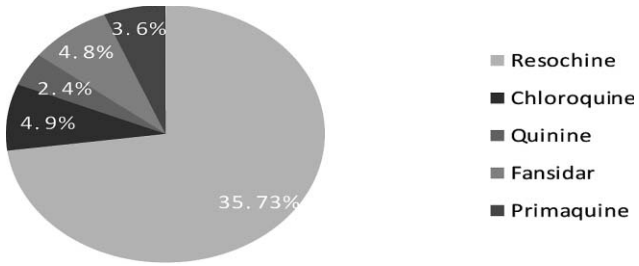

Figure 7　Commonly known medicine for malaria

Table 4　Knowledge, Attitude and Practice of Malaria

CHARACTERISTICS	VILLAGE NAME			
	COASTAL		HILL	
	PEMONGKONG(%)	BUNGIN(%)	PERIGI(%)	SEPIT(%)
Know ≥3 malaria symptoms	88 (44.4)	199 (61.2)	142 (47.7)	88(44.4)
Commonly known malaria symptoms				
• Fever	190 (96.0)	306 (94.2)	183 (61.4)	173(87.4)
• Shivering	185 (93.4)	289 (88.9)	177 (59.4)	179(90.4)
• Sweating	117 (59.1)	211 (64.9)	152 (51.0)	95(48.0)
• Headache	120 (60.6)	296 (91.1)	131 (44.0)	43(21.7)
• Abdominal symptoms	41 (20.7)	153 (47.1)	96 (32.2)	10 (5.1)
• Fatigue	98 (48.5)	243 (74.8)	101 (33.9)	42(21.2)
• Respiratory symptoms	26 (13.1)	87 (26.8)	80 (26.8)	7 (3.5)
• Seizure	32 (16.2)	140 (43.1)	24 (8.1)	10 (5.1)
Know ≥2 malaria prevention methods	0 (0.0)	5 (1.5)	1 (0.3)	3 (1.5)
Commonly known malaria prevention methods				
• Human behavior modification	38 (19.2)	45 (13.5)	11 (3.7)	44(22.2)
• Environmental management	7 (3.5)	4 (1.2)	1 (0.3)	9 (4.5)
• Vector control	2 (1.0)	52 (16.0)	2 (0.7)	3 (1.5)
Know the treatment for malaria	4 (2.0)	7 (2.2)	5 (1.7)	32(16.2)
Knowledge of malaria				
• Poor	198(100.0)	325(100.0)	298(100.0)	197(99.5)
• Good	0 (0.0)	0 (0.0)	0 (0.0)	1 (0.5)

cally between the coastal and hilly areas concerning with the knowledge on malaria treatment. But the correlation is weak ($p < 0.001$; Spearman correlation $= 0.126$).

Overall the malaria knowledge is poor. There is merely one person (0.1%) in Pemongkong village that had a good understanding of malaria (table 4). Nevertheless, 4.2% of respondents recognized two of the three constructs, i.e. malaria symptoms and prevention, malaria symptoms and treatment or malaria prevention and treatment. When it is compared between the area characteristics, i.e. the coastal and hilly, the malaria knowledge is not different significantly ($p = 0.304$).

2. 3. 1. Source of information on malaria

The source of information on malaria is mostly coming from health professional and health cadre as shown in figure 8. Information on malaria, furthermore, have also been introduced on Friday sermont by religious leaders and any other religious gathering in both coastal (29.3%) and hilly area (1.4%). Besides information on malaria, Friday sermont and religious gathering has also been used to deliver health related information including personal and environmental hygiene (59.4%), mental illness (1.2%), disease prevention (4.6%) and treatment (0.2%). There is a statistically significant different between health professional as the informant and others regarding knowledge on malaria symptom (see. Figure 9). However, the correlation between this variable is weak ($p = 0.001$, Spearman correlation $= 0.101$).

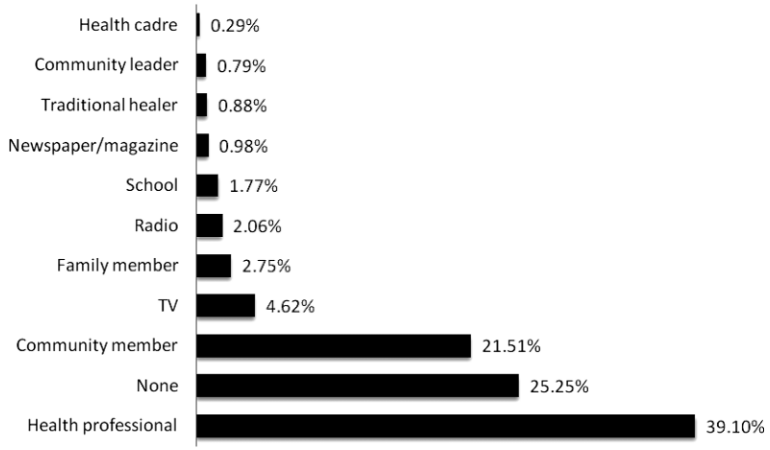

Figure 8　Source of information for malaria

Furthermore, it is assumed that experiences of having malaria before would provide a better knowledge on malaria, but it is not true in this study. There is no different knowledge between respondents that stated suffering from malaria before and who didn't ($p = 0.44$). With regard to malaria symptoms, there is a statistically significant difference between those who experienced having malaria before and who didn't but the correlation is

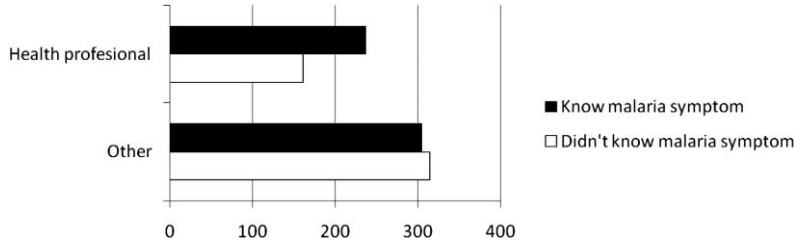

Figure 9　Knowledge of malaria symptom from different informants

weak ($p < 0.001$, Spearman correlation 0.110).

2. 3. 1. Vulnerable behavior and malaria prevention practices

Certain high-risk malaria behaviors are focused on the transmission of malaria, e.g. travelling to endemic area, outdoor-night activities, sleeping in open spaces without bednets or other mosquito's protection, and wearing open-clothes. Table 5 summarized common respondent's vulnerable behaviors, i.e., high-risk malaria behaviors.

Table 5　High-risk malaria behaviors

BEHAVIOURS	VILLAGE NAME			
	COASTAL		HILL	
	PEMONGKONG (%)	BUNGIN(%)	PERIGI(%)	SEPIT(%)
Outdoor-night activities :				
• Working	51(25.8)	142(43.7)	58(19.5)	17 (8.6)
• Night patrol	31(15.7)	8 (2.5)	24 (8.1)	37(18.7)
• Praying	2 (1.0)	12 (3.7)	22 (7.4)	6 (3.0)
• Other religious activities	1 (0.5)	3 (0.9)	9 (3.0)	7 (3.5)
• Shower	0 (0.0)	5 (1.5)	2 (0.7)	0 (0.0)
• Gathering with friends/neighbors	0 (0.0)	56(17.2)	59(19.8)	4 (2.0)
• Watching TV	12 (6.1)	5 (1.5)	29 (9.7)	0 (0.0)
• Taking clean water	0 (0.0)	1 (0.3)	2 (0.7)	0 (0.0)
• Shopping	0 (0.0)	7 (2.2)	0 (0.7)	0 (0.0)
• Visiting relatives/friends	0 (0.0)	19 (5.8)	21 (7.0)	1 (0.5)
Sleep in open spaces :				
• Routine (≥5 times per week)	14 (7.6)	53(16.5)	13 (4.4)	2 (1.0)
• Often (3–4 times per week)	26(14.1)	79(24.6)	33(11.1)	8 (4.2)
• Seldom (≤2 times per week)	55(29.9)	67(20.9)	59(19.9)	23(12.0)
• Never	89(48.4)	122(38.0)	192(64.6)	159(82.8)

There are three common outdoor-night activities among local people, i.e., working and preparing at night, night patrol and gathering with friends or neighbors. These high-risk malaria activities are, however, difference between four villages. Respondents living in villages in coastal area are generally working as fisherman that urges them to work outdoor at night. The farmers living in hilly areas also work at night, in particular during the harvesting season. More men tend to do outdoor-night activities. Comparing with the sexuality, there is a statistically significant difference with regard to the outdoor and night activities ($p < 0.001$). But the correlation is weak (Spearman correlation $= 0.273$).

Working individuals also tend to do more outdoor and night activities compared to those who aren't employed ($p < 0.001$, Spearman correlation = 0.164).

Almost half of respondents (43.5%) slept in open spaces and outside of their house at least two nights in a week. This sleeping behavior is particularly prominent in coastal area villages, i.e., Bungin and Pemongkong. More men (74.3%) and working individuals (94.9%) sleep in open spaces. This difference between sex and working status is significant statistically ($p < 0.001$ and $p = 0.005$, consecutively) though the correlation is weak (Spearman correlation = 0.262 and Spearman correlation = 0.103, consecutively).

The practices of preventing malaria are relatively limited to the use of anti-mosquito goods and impregnated bednets. As shown in table 6, the most common anti-mosquito goods are different between four villages. In Pemongkong and Bungin, mosquito's coil is commonly used (49.5% and 66.8%, consecutively), while in Perigi and Sepit, chemical spray is better as they acknowledge (12.1% and 80.8%, consecutively).

Table 6　Malaria Prevention Practices

BEHAVIOURS	VILLAGE NAME			
	COASTAL		HILL	
	PEMONGKONG (%)	BUNGIN(%)	PERIGI(%)	SEPIT(%)
Use of anti-mosquito :				
• Mosquito's coil	98(49.5)	217(66.8)	1 (0.3)	14 (7.1)
• Spray	1 (0.5)	18 (5.5)	36(12.1)	160(80.8)
• Anti-mosquito's lotion	5 (2.5)	120(36.9)	2 (0.7)	9 (4.5)
Bednets utilization :				
• Husband and wife	6 (3.0)	0 (0.0)	3 (1.0)	8 (4.0)
• Children	7 (3.5)	2 (0.6)	1 (0.3)	15 (7.6)
• Children and mother/father/ grandparents	16 (8.1)	2 (0.6)	2 (0.7)	5 (2.5)
• Grand parents	1 (0.5)	2 (0.6)	1 (0.3)	1 (0.5)
• Other family members	3 (1.5)	0 (0.0)	4 (1.3)	3 (1.5)
• All family members	35(17.7)	8 (2.5)	20 (6.7)	22(11.1)
• Respondents	6 (3.0)	0 (0.0)	1 (0.3)	17 (8.6)
• Never used bednets	122(61.6)	308(94.8)	265(88.9)	124(62.6)

Although most respondents acknowledge bednets utilization as a mean of preventing malaria, there are only a few of them (18.9%) used it daily. Table 6 summarized bednets utilization in the family. Approximately 64.3% of respondents didn't own bednets. Bednets are used only in 54.0% respondents that own them. Among respondents that stated using bednets, there are fewer respondents (26.2%) that specifically provide the nets for children (Figure 10).

2. 4. Community, culture and religious aspects

More than half respondents (60.3%) participate in community activities. The participation, however, differs between four villages. In general, most respondents participate in 'gotongroyong (community collaboration)' more than other social gathering available in

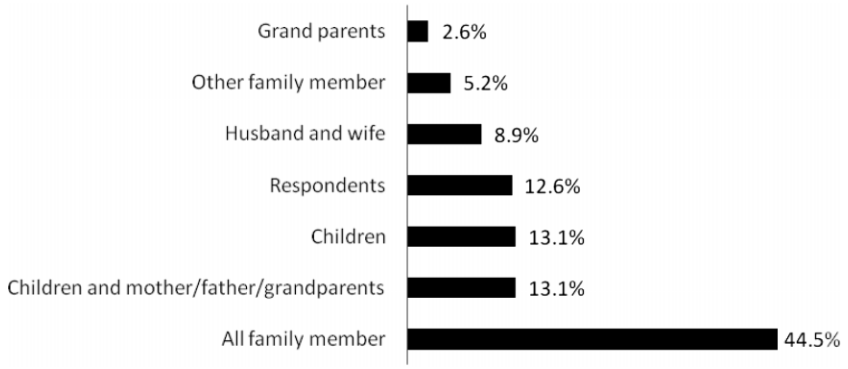

Figure 10　Bednets utilization among family member

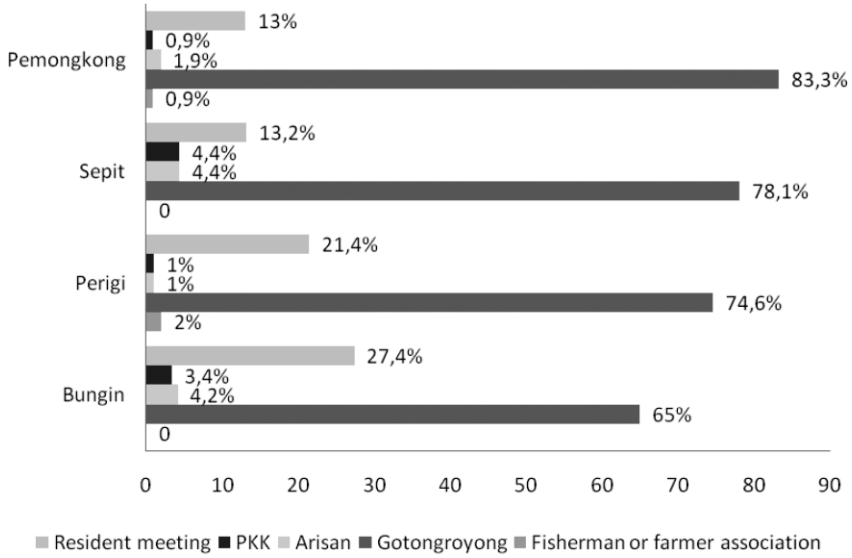

Figure 11　Community social gathering

the community (Figure 11).

There are fewer women participated in a common residential meeting such as RT, RW or Dusun. Statistical analysis suggests that men tend to participate in community activities more than women ($p<0.001$; Spearman correlation$=0.230$) as well as employed individuals ($p=0.001$; Spearman correlation$=0.109$). However, the correlation between sex and employment status and participation in community activities is weak. Based on respondent's age, there is no statistical difference between elderly and adult in terms of participation in community activities ($p=0.402$).

Compared to community activity, there are more respondents that participate in religious activities (91.8%). Friday sermon, praying in the mosque, and 'pengajian (a religious meeting)' are the most common attended activities(Figure 12). Statistical analysis sug-

gest that men, employed, and elderly are more frequent in participating in religious activities ($p<0.001$; Spearman correlation$=0.256$; $p<0.001$; Spearman correlation$=0.170$; $p=0.004$; Spearman correlation$=-0.002$, consecutively). These correlations, however, are weak.

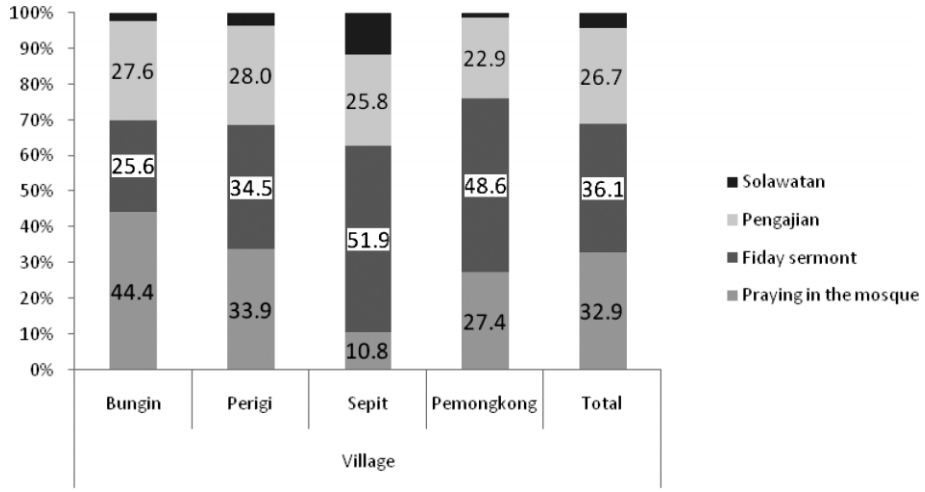

Figure 12　Common religious activities

Furthermore, there are fewer respondents (18.1%) that become a member of community organizations. There are different types of organizations between villages, in which the respondents participated. In Pemongkong and Sepit, PAMSWAKARSA, a community-based organization that mostly work to provide safety and security for the local community, is a prominent local organization (Table 7). Unlike in Pemongkong and Sepit, there are no prominent organization in Bungin and Perigi.

Table 7　Respondent's participation in an organization

ACTIVITIES	VILLAGE NAME			
	COASTAL		HILL	
	PEMONGKONG (%)	BUNGIN(%)	PERIGI(%)	SEPIT(%)
Pesantren	1 (0.5)	3(0.9)	9(3.0)	5 (2.5)
Koperasi	6 (3.0)	2(0.6)	2(0.7)	2 (1.0)
Karang taruna	1 (0.5)	9(2.8)	2(0.7)	3 (1.5)
Political party	0 (0.0)	11(3.4)	1(0.3)	2 (1.0)
PAMSWAKARSA	80(40.4)	0(0.0)	1(0.3)	20(10.1)
BPD	0 (0.0)	2(0.6)	0(0.0)	0 (0.0)
Local NGO	0 (0.0)	2(0.6)	1(0.3)	0 (0.0)
Religious based organization	1 (0.5)	4(1.2)	2(0.7)	1 (0.5)
PKK	0 (0.0)	2(0.6)	1(0.3)	0 (0.0)
Farmer association	1 (0.5)	0(0.0)	2(0.7)	0 (0.0)
Linmas	0 (0.0)	3(0.9)	0(0.0)	0 (0.0)
LKMD	0 (0.0)	0(0.0)	0(0.0)	1 (0.5)

Religious and community activities are the most important social activity found in this study. As shown in Figure 13, participation in religious activities is far more prominent than other activities.

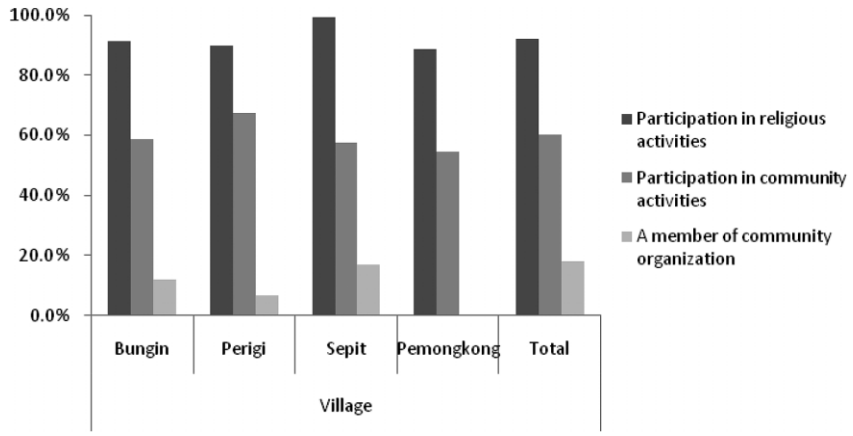

Figure 13　Community participation in social and religious activities

In a typical East Lombok community like Sepit and Pemongkong, religious leaders are still considered more influential than local formal leaders like village heads and officers. But this does not apply to the cases in Perigi and Bungin, where formal leaders have a slightly higher position in terms of influential figures in the community.

2. 5. Conclusion

The result of CBDESS, Part 2 shares similar findings compared to the CBDESS, Part 1 (Mitsuda, Mulyanto (eds.), 2007). The community members have predominantly a low level of malaria knowledge. They also have a very low level of formal education. One interesting finding is that the community members relied on health professionals as the primary source of malaria. This result urges us to pay more attention to how to make health professionals more effectively to educate the community. Special training may be required to upgrade health professionals' capability in advocating and educating the community.

More than 70% respondents did not continue their education beyond elementary school. Approximately 20% of them do not even attend formal education at all. Therefore we should consider how to educate this people as early as they enter elementary education and also those who are outside formal education system.

In the formal education system, malaria education needs to be integrated in the elementary school curriculum. This will enable young children to learn about malaria. Hopefully their knowledge of malaria will be sufficient to help them preventing malaria,

even if they are not going to higher education level.

Outside the formal education system, malaria education can take place in community activities, especially religious activities as the most attended activities in the community. We can bring together health professional as the trusted source of malaria information and religious leader as the most influential persons to improve community knowledge and behavior. But we also have to consider different patterns in the area like Bungin and Perigi where formal leaders are more respected. We can joint health professionals and formal leaders in the malaria education.

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（みつだ　ひさよし　公共政策学科）

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